Encouraging Roots to Grow Deep

Cleantech sector emerging strong in state

By Zaher Karp

In 2005, cleantech venture capital investments totaled just over $530 million. Through the first three quarters of 2007, that number had risen to over $2.6 billion, according to a report by Thompson Financial. Recent political movement suggests a mounting awareness of the need for renewable energy, such as President Bush's Twenty in Ten proposal, aimed at reducing American gasoline consumption by 20 percent through renewable and carbon-neutral energy development in 10 years. The last year also brought increasing local support of cleantech and the organizations that produce them, including Governor Jim Doyle's Grow Wisconsin plan, which suggests the creation of new tax credits to reward research-oriented companies.

"Our nation's dependence on foreign oil must end, but drilling our way out of this crisis is not the answer," said Doyle during his Grow Wisconsin announcement. "We must invent and innovate our way to a cleaner, safer energy future. And tonight, from generating wind power in Fond du Lac to harnessing the power of biomass in Rice Lake, Wisconsin is ready to lead the way." This emerging green compass may lead investors to cleantech, and Wisconsin's lush environment encourages roots to grow deep in this emerging sector. Following is a look at cleantech and some examples of who's doing what in Dane County.

Setting up for success

Locally, **Tom Still**, president, **Wisconsin Technology Council**, highlights the upcoming **Great Lakes Bioenergy Research Center**, which was provided for by the U.S. Department of Energy and state investments intended to develop plant biomass as an alternative energy source, or biofuels.

"It's going to be one of three research centers of its kind in the country that will be established. The purpose of this one is to discover technologies that enhance production of cellulosic ethanol," he said. Cellulosic ethanol is ethanol produced from numerous biomass sources, such as wood or even paper waste, and has the potential, some researchers believe, to offer more cost-efficient energy and have a smaller environmental footprint. The numerous forests of Wisconsin are not only beautiful, but also functional as a valuable source for the conversion of biomass.

This center's creation was a result of the **Wisconsin Bioenergy Initiative**, which is geared toward developing fuel and energy resources from nonfood sources, which will also spur economic growth.

"This center will be the centerpiece of our

state's efforts to lead the county toward energy independence and, just like the Institutes for Discovery, this will be an economic engine that will translate new discoveries into high-paying jobs," Doyle said.

A future collaborator in this new research center is the Middleton-based molecular biotechnology firm, **Lucigen Corporation**. Lucigen plans to work to develop the gene cloning tools used to discover new higher-efficiency enzymes which would assist in biofuel production. In 2006, Lucigen created **C5-6 Technologies**, which will also assist the center by screening for the enzymes that will allow the breakdown of biomass into simple sugars, which can later be fermented into alcohol. C5-6 is working on enzymes that will "improve the productivity of the existing corn ethanol process by 10 percent … providing significant savings," enzymes that will "convert soy meal carbohydrate for the first time, concentrating the protein in the meal and providing two high value co-products." C5-6 is also exploring cellulosic ethanol, as the company can now convert cellulosic biomass using a dry mill process technology, which is proving more cost-effective than other cellulosic-conversion processes.

Doing it BEST

BEST Energies, a family of biofuel technology companies, holds two technologies that are vital to the creation of clean energy alternatives: **BEST Pyrolysis, Inc.** and **BEST BioDiesel**.

"We recently finished the [Best BioDiesel Cashton] plant," which aims to produce eight million gallons of biodiesel fuel per year from soybean oil, says **Cory Wendt**, vice president of business development. "Our technology enables the use of lower-quality feed stocks — we don't pretreat oil in the traditional fashion, so we don't have the yield losses or energy consumption that another, more traditional biodiesel company might have."

BEST Pyrolysis uses a process known as slow pyrolysis, which is the heating of feed material (such as poultry litter or nut shells) in a kiln that results in the creation of synthetic gas for electrical generation, provides charcoal (char) that can be used for filtration, fuel or soil enrichment and has a waste heat byproduct that can be used in the plant or exported to others.

Dr. Randy Cortright of Virent Energy Systems holds a beaker filled with Virent's biogasoline product.

—Photo courtesy of Virent Energy Systems

Greening gasoline

In 2002, **Virent Energy Systems** was founded to commercialize the Aqueous Phase Reforming process, which was invented at UW-Madison by **Dr. Randy Cortright** and **Dr. Jim Dumesic**. The process has since been refined and resulted in the creation of the BioForming™ process, which enables the production of transportation fuels, gases or chemicals, whereas the APR process primarily focused on generating hydrogen from sugar.

"What we are making are hydrocarbon fuels that have the same properties and functionality as fossil fuels," **Mary Blanchard**, Virent's director of marketing. "The advantage of this system is that we can create gasoline that has the same energy content as petroleum gasoline, whereas ethanol has about a third-less energy. It is cost-effective and universally usable."

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Cleantech investments are getting more and more attention, and Governor Doyle is fighting for the economic encouragement of these green companies, such as his recent campaign to increase the availability of renewable fuel by one billion gallons through the provision of new tax credits for biodiesel fuel producers, adding 400 new renewable fuel pumps on Wisconsin's roads, as well as passing a renewable fuel standard to require oil companies to provide renewable fuel.

"The bottom line is that, ultimately, everything we are doing benefits the agricultural community," says **BEST's Tony Janowiec**, vice president of operations. Our focus is that all of our technology enhances Wisconsin's economy by first starting with the fundamental philosophy that everything we do goes back and adds value to the farm."

"We have been encouraged by some of the recent biofuel initiatives," he adds, "but Wisconsin is really far behind compared to incentives in nearby states. We chose to locate here, it's our home, but we would certainly like to see things move along more aggressively than they have in the past. We're working hard to make sure that Wisconsin is a platform that attracts renewable energy and investments." n

By definition

Cleantech, says Still, is any technology that can contribute to solutions regarding energy generation, energy conservation or national resource conservation.

Biofuels, transport fuels created from plant and recycled material, are separated into two classes, either biodiesel, a diesel fuel alternative derived from vegetable oils, often soy or corn, or bioethanol, a gasoline-substitute produced from sugars or starches.